Organic solvent tolerant lipases

Abstract

The stability of biocatalysts is an important criterion when dealing with bioprocesses at high temperature in order to sustain its operational activity throught the processes. Much efforts has been focused on the screening of microorganisms harboring intrinsically stable biocatalysts. This chapter presents an overview of the issues involving screening, growth and production, purification and characterization of wild-type and recombinant enzymes with emphisis on thermostable lipases. High temperature, using olive oil as the sole carbon source, dictated the isolation of thermophilic lipolytic bacteria Geobacillus sp. strain T1 and Bacillus spp. strain 42 and strain L2.Tryptone and casamino acid were the best nitrogen sources, while corn oil and Tween 60 were the best substrates for the production of strain 42 lipase and L2 lipase, respectively. Molecular expression of thermophilic genes in mesophilic host not only reduced the exposure of recombinant enzymes to denaturing environment but facilitate protein purification and expression in bulk quantity in a shorter time. These lipases exhibited optimum temperature and pH of 70-80C and 7-9, respectively. These valuable properties create various potential industrial applications, particularly palm-based industry with respect to its high activity and substrate solubility at high temperature

◦The nature of the enzymes will be denatured in the presence of the organic solvents. Solvents not only affect enzyme stability but also change enzyme specificity. Most of the reports have been published concerning solvent stable enzymes. However, these enzymes are not naturally solvent stable enzymes that direct attempts from screening of organic solvent tolerant bacteria. In this chapter, we review the production and characterization of organic solvent tolerant lipases on the first attemps to screen organic solvent tolerant lipases from Bacillus sphaericus 205y, Bacillus sp. stain 42 and Pseudomonas sp. S5. All of these bacteria were proven to be organic solvent tolerant lipase producers. These lipases were stable in the organic solvents with log P value between 2.0 to 3.6. Organic solvent tolerant lipases from Pseudomonas sp. S5, B. sphaericus 205y, Bacillus sp. strain 42 were successfully purified to homogeneity. The optimum temperatures of these lipases were 45◦C, 55◦C and 70◦C, respectively. These purified lipases exhibited great stability and high activity in most of the organic solvents tested, therefore, these valuable criteria should not be neglected as important products in different fields could be developed from these lipases.